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Thinning Increases Growth in Young Ponderosa Pine Plantations of the Palouse Range

by
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INTRODUCTION

Small private woodlots throughout the Pacific Northwest frequently do not attain maximum wood fiber production because they receive little or no stand management. In many cases productivity, and hence the attainment of merchantable trees, is seriously reduced by the overcrowding of individual stems. Thinning is a simple method that land managers employ to alleviate overcrowding, thereby reallocating the available growing space to selected crop trees. Crop trees from thinned plots will grow more rapidly than comparable trees from unthinned plots, resulting in the production of more usable, high-value wood products for the landowner.

This paper reports on the excellent growth responses obtained by thinning young-growth ponderosa pine (*Pinus ponderosa* Laws.) plantations in the Palouse range of northern Idaho.[1]

STUDY METHODS

Ponderosa pine plantations were established on the University of Idaho Experimental Forest from 1941 to 1943. Between 1959 and 1964, specially thinned study plots were established, on which residual or leave trees were pruned to 6 ft in height (Table 1).[2] A "low" thinning method was utilized in which the smallest, least vigorous

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[1] The pine plantations are located on the Big Meadow Cr. Unit of the College of Forestry, Wildlife and Range Sciences Experimental Forest, approximately 3 miles northwest of Troy, Idaho.

[2] The authors are grateful to Dr. Merrill E. Deters, emeritus professor of silviculture, for the plot establishment and thinning.

Table 1. Basic information for the twelve thinned and three unthinned ponderosa pine plots.

Plot	Measurement[1] Period T1 T2	Plot Size	Trees/Ac T1	Trees/Ac T2	BA/Ac T1	BA/Ac T2	Volume/Ac T1	Volume/Ac T2	Average Diameter T1	Average Diameter T2
(Thinned)		(ac)	(trees/ac)		(sq ft/ac)		(cu ft/ac)		(inches)	
59-1	1959-1974	0.40	185	180	27.5	78.9	382	1277	5.2	9.0
59-2	1959-1974	0.40	307	290	39.3	99.5	534	1629	4.8	7.9
59-3	1959-1974	0.40	372	340	40.5	99.8	535	1514	4.5	7.3
61-1	1963-1974	0.10	180	180	69.7	114.1	1069	1905	8.4	10.8
61-2	1961-1974	0.10	240	230	49.7	92.1	697	1432	6.1	8.6
61-3	1961-1974	0.23	200	174	53.5	102.3	776	1695	7.0	10.4
61-4	1961-1974	0.23	147	139	37.4	85.0	537	1414	6.8	10.6
61-5	1961-1974	0.23	186	186	54.0	103.6	814	1708	7.3	10.1
63-1	1963-1974	0.23	156	156	41.0	78.1	601	1272	6.9	9.6
63-2	1963-1974	0.23	217	212	45.9	85.5	646	1334	6.2	8.6
63-3	1963-1974	0.23	355	355	86.6	151.4	1273	2407	6.7	8.8
64-1	1964-1974	0.23	182	173	40.7	75.2	584	1196	6.4	8.9
Thinned Plot Average	-	0.25	227	218	48.8	97.1	704	1565	6.3	9.2
(Unthinned)										
75-1	1963-1974	0.23	551	551	130.4	158.3	1910	2387	6.6	7.3
75-2	1959-1974	0.13	802	802	108.4	147.4	1533	2168	5.0	5.8
75-3	1961-1974	0.23	447	447	91.5	123.8	1307	1845	6.1	7.1
Unthinned Plot Average	-	0.20	600	600	110.1	143.2	1583	2133	5.9	6.7

[1] Measurement period is defined as that period of time from immediately after thinning (T1) through 1974 growing season (T2).

trees were removed. This method results in reduced competition for the larger, more vigorous crop trees. Numbers of trees per acre ranged from 147, spaced at 17 ft x 17 ft intervals, to 355, spaced at 11 ft x 11 ft intervals after thinning. Diameter and height measurements were made on each tree at 5-year intervals after thinning.[3] Three unthinned control plots were established in 1975 and increment core measurements were employed to recreate the tree dimensions at the time of thinning.

STUDY RESULTS

Average yearly growth of the thinned stands from time of thinning until 1974 was compared with the unthinned control plots. Growth comparisons in terms of average tree diameter, basal area per acre, cubic foot volume per acre and cubic foot volume per tree[4] were selected as a basis of analysis (Table 2, Fig. 1). Average

[3] The growth responses reported in this paper are based on measurements taken immediately after thinning (T1) and in 1974 (T2).

[4] See Glossary for definitions of these terms.

Table 2. Average yearly growth responses for the twelve thinned and three unthinned ponderosa pine plots.

Plot	DBH	BA/Ac	Vol/Ac	Vol/Tree	Number of years required to grow 1 inch in diameter
	Average yearly growth after thinning				
(Thinned)	(in.)	(sq ft/ac)	(cu ft/ac)	(cu ft)	
59-1	0.25	3.4	59.6	0.32	4.0
59-2	0.21	4.0	73.0	0.24	4.8
59-3	0.19	4.0	65.3	0.17	5.3
61-1	0.22	4.0	76.0	0.42	4.6
61-2	0.19	3.3	56.6	0.24	5.3
61-3	0.26	3.8	70.7	0.35	3.8
61-4	0.29	3.7	67.4	0.46	3.4
61-5	0.22	5.5	68.8	0.37	4.5
63-1	0.25	3.4	61.0	0.39	4.0
63-2	0.18	3.6	62.5	0.29	5.5
63-3	0.19	5.9	103.0	0.29	5.3
64-1	0.25	3.4	61.2	0.34	4.0
Average	0.23	4.0	68.8	0.32	4.5
(Unthinned)					
75-1	0.06	2.5	43.4	0.08	16.7
75-2	0.05	2.6	42.3	0.05	20.0
75-3	0.07	2.5	41.4	0.09	14.3
Average	0.06	2.5	42.4	0.07	16.7

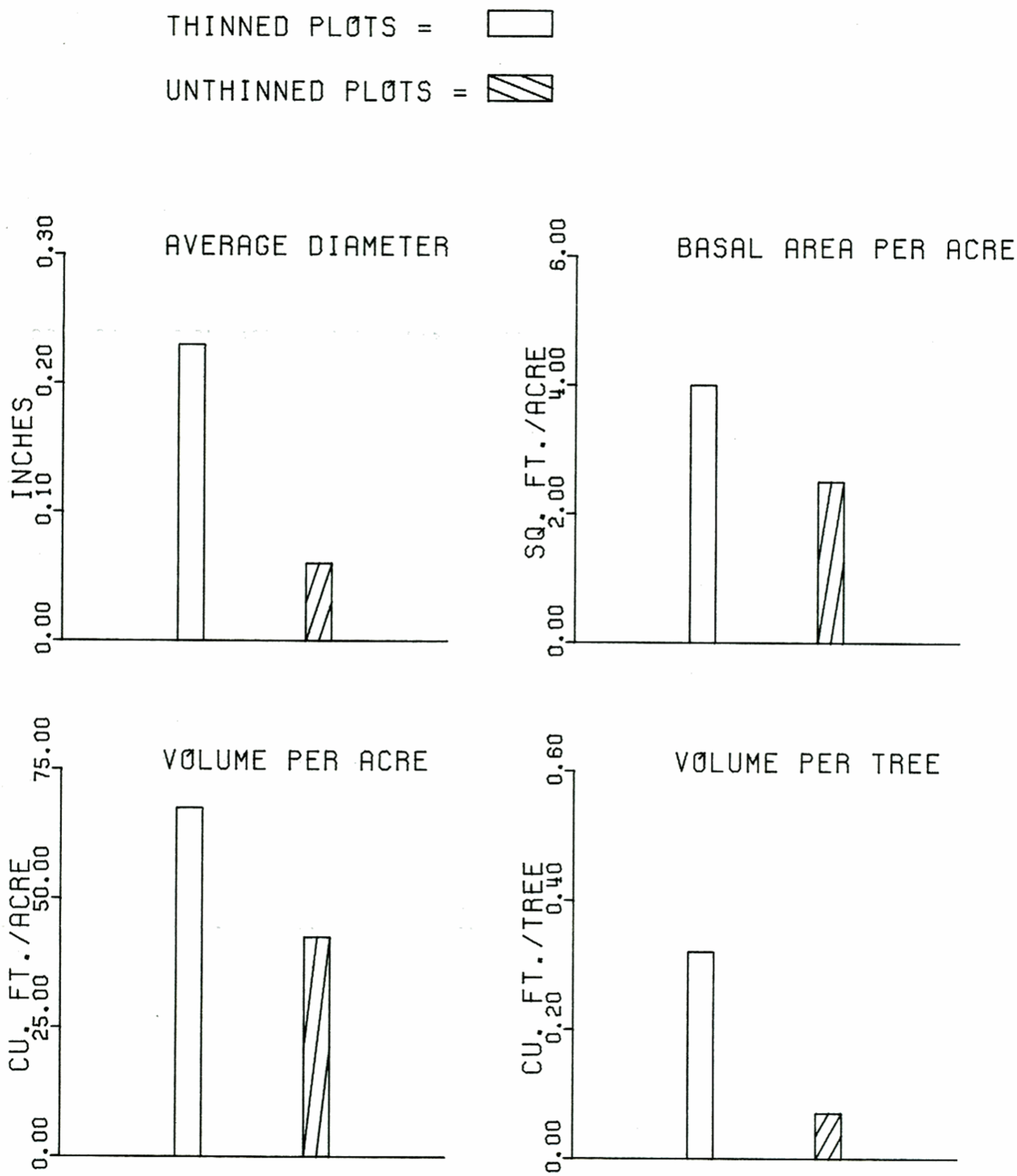

FIG. 1. AVERAGE YEARLY GROWTH COMPARISONS SINCE THINNING

annual diameter growth increased from 0.06 inch on unthinned plots to 0.23 inch on thinned plots, representing a 386 percent increase (Fig. 2). Stated another way, this means that the number of years required for a selected crop tree to grow 1 inch in diameter was 4.5, while 1 inch diameter growth for a tree from an unthinned plot required 16.7 years or over three and three-quarter times as long. Average annual basal area growth increased from 2.5 sq ft per acre on the unthinned plots to 4.0 sq ft per acre, or a 160 percent increase from thinning. Net volume growth averaged 42.4 cu ft per acre per year for the unthinned stands, while thinning resulted in a yearly average increase of over one and one-half times (165 percent) to 68.8 cu ft per acre per year.

Additionally, volume growth per crop tree increased from 0.07 cu ft per year to 0.32 cu ft per year. Thus, the average crop tree after thinning is producing four and one-half times as much wood fiber per year as the average tree from an unthinned plot. Testing has shown statistically significant growth differences in the four comparisons between thinned and unthinned plots.

WHAT THIS MEANS TO THE LANDOWNER

The thinning of young-growth ponderosa pine is beneficial to the landowner in a variety of ways. This study has illustrated that thinned pine plantations can result in:

1. increased growth of the selected crop trees, resulting in
2. more rapid attainment of a marketable high-value wood product, resulting in
3. a faster and usually higher monetary return to the landowner.

Additionally, thinning overcrowded pine plantations results in a more vigorous plantation which is usually less vulnerable to insect and disease problems.

GLOSSARY

1. Trees/Ac – the total number of trees present on one acre of land.
2. Basal area per acre (BA/Ac) – the summation of the cross-sectional areas of the trees found on one acre of land, expressed in square feet per acre.
3. Volume per acre (Vol/Ac) – the total stem cubic foot volume of all the trees found on one acre of land, expressed in cubic feet per acre.
4. Volume per tree (Vol/Tree) – the average cubic foot volume per tree, expressed in cubic feet.

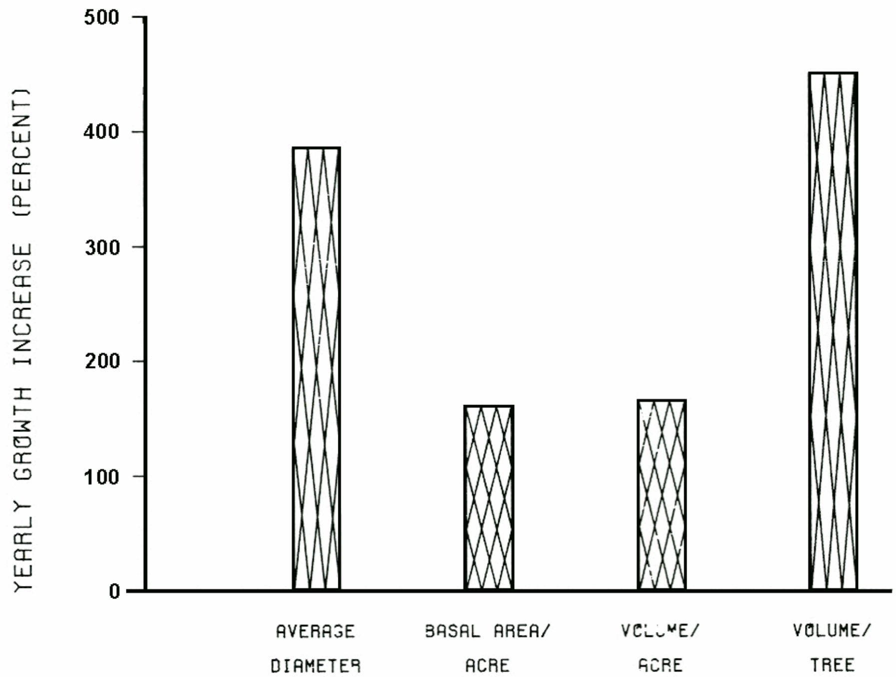

FIG. 2. YEARLY GROWTH INCREASE FOR THE THINNED PLOTS, AS COMPARED TO THE UNTHINNED CONTROL PLOTS